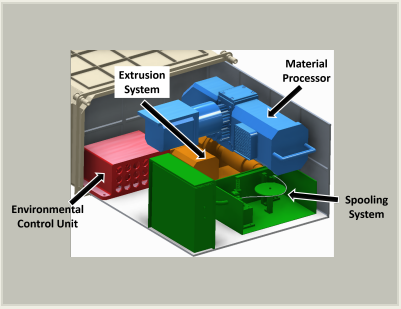
Small Business Innovation Research/Small Business Tech Transfer

R3DO: A Plastic Recycling System For Creating 3D Printer Feedstock On-Orbit, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

An automated in-space recycling system for 3D printer feedstock will provide game-changing resupply benefits including but not limited to launch mass reduction, mission reliability increases, and decreased reliance on resupply from Earth. To bring these benefits to ISS in the near term, Made In Space proposes the further development of their unique recycling system, called R3DO, for transforming ABS plastic parts on ISS into 3D printer filament feedstock. R3DO leverages Made In Space's knowledge of the extrusion process in microgravity, which enables 3D printing in space. R3DO's patent-pending technologies designed to meet NASA ISS requirements, and include multiple unique innovations such as filament use in microgravity, the low-power heating system, microgravity stabilization, material control, breaker plate migration, material-filter interactions, cooling characteristics, and safety mechanisms. Made In Space has developed and tested four prototype iterations of R3DO in the lab, to verify that the recycler is capable of recycling 3D printed material into feedstock and that that feedstock can be used with Made In Space printers. Further, Made In Space has flown one of these prototypes on several microgravity flights to verify that it is capable of recycling ABS plastic and extruding feedstock in microgravity. Feedstock extruded in microgravity was then used to successfully print parts using Made In Space 3D printers. For Phase 1 development, Made In Space will conduct a feasibility study and create a bench-top proof of concept of the full ISS system, based on the aforementioned prototypes, with a planned Technology Readiness Level ("TRL") of 5. Phase 2 will produce an Engineering Test Unit and accumulate data at TRL 6, and Phase 3 will feature the manufacturing of a Flight Unit, integration with the ISS and commercial applications, demonstrating TRL 9.



R3DO: A Plastic Recycling System For Creating 3D Printer Feedstock On-Orbit Project Image

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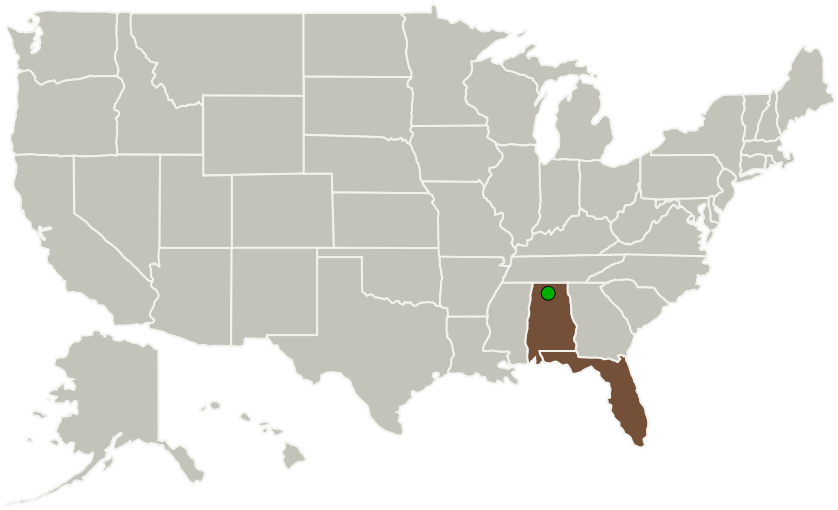
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Made in Space, Inc.	Lead Organization	Industry	JACKSONVILLE, Florida
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Florida

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137727)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Made in Space, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

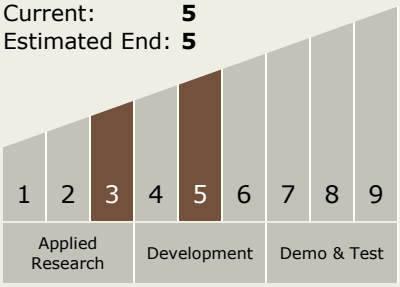
Carlos Torrez

Principal Investigator:

Matthew C Napoli

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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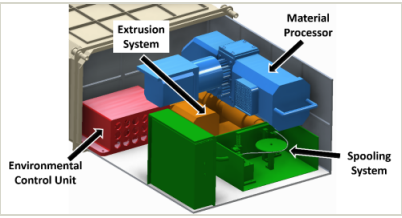
Images



Project Image
R3DO: A Plastic Recycling System For Creating 3D Printer Feedstock On-Orbit Project Image
(https://techport.nasa.gov/image/134353)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.6 Repurpose Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System